

Science museum not yet, but 10 years communicating sciences in the same sense

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*"Walker,
there is no path to follow,
you make the path by walking"*
Antonio Machado, Campos de Castilla 1912

Introduction

Interactive exhibitions, such as interactive science museums, have a primordial function that aims at a direct encounter with the public, where dissemination, educational character and playful sense are part of their essence and ultimate meaning, contributing to the public having access to the scientific culture.

This type of space offers the visitor the opportunity to discover and experiment with different objects, which in the first instance puts into play all their senses and makes scientific knowledge live directly and attractively. Scientific and technical information explained in an accessible and interesting way by the use of a great variety of means is made available to the non-specialized visitor.

Like the interactive science museums, the exhibitions are a space where children and adults understand why things happen, making them happen. Through concrete and direct action on elements within their reach they are allowed to know, explain, experiment, feel and question.

The city of Tandil (Argentina) does not have a Science Museum with the characteristics presented in this work, where citizens can internalize scientific work, clear doubts, learn about the progress of science and technology in a pleasant and interactive way, where he can "enjoy science". With these objectives, an Interactive Science Exhibition has been developed since 2008, called DIVERTITE EXPERIMENTANDO (DE in what follows). As such, DE offers a way to learn while playing; a meeting place where interests awaken and projects, ideas and new concerns flourish. It is based on the philosophy of "PROHIBITED DO NOT TOUCH" and "LEARNING BY DOING". It is a public learning space, which poses a new form of interrelation between the object of knowledge and the individual.

The exhibitions offer opportunities for collective experimentation; the roles of teacher and student alternate constantly and the explanations come from all directions. The exhibitions offer diverse paths towards scientific and technological knowledge, often as an adventure full of surprises, where the best question is the one that leads to new and exciting questions. And on the way, some enigmas are resolved, recognizing that there are no absolute truths and that mistakes are an

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opportunity to learn. The interactive samples favor a multisensory and multidimensional learning environment that feeds the curiosity. Hence "forbidden not to touch", "forbidden not to think".

Started in 2008, without having a stable physical place, the interactive and itinerant science fair Divertite Experimentando develops multiple actions in order to bring science in an entertaining, mild and challenging way to the citizens of the city and the region. In particular, their temporary presentations are positively received by members of the educational community: students who are pleasantly surprised by encouraging their desire to investigate and learn about the phenomena of nature and how science studies them, and teachers who also find alternative means for the treatment of scientific subjects in the classroom. In this work we want to share the task and experience gathered from ten years of work carrying out DE and the impact that it has had in the community and on ourselves. A brief description of the main actions carried out in these 10 years, are mentioned according to a timeline from the birth of DE to its current situation.

Development. The relevant facts of Divertite Experimentando

The first times: The birth of DE and the link with the School of Technical Education No. 1 of the city of Tandil

In 2007, a group of members of the Faculty of Exact Sciences (UNICEN) were called to collaborate with a group of adolescents from a neighborhood in the city of Tandil, providing them a series of scientific experiences, that they later could share with their friends, families and other members of the neighborhood. The focus of the intervention was on the teenagers having an experience of achievement and recognition of their abilities; it was not training as something that came from outside, but in the sense that young people discovered and recognized their own way of exercising their own abilities (1). Alternative languages such as art, science and experimental activities become relevant for the approach to complex communities, which are more easily committed to the processes if they feel involved in the formulation and understanding of the problem. This experience, successful and highly rewarding, led us to consider the possibility of working in a similar way with students from a technical school in our city. At the same time, we began to discover the existence of interactive science centers: Exploratorium, CosmosCaixa, Ludotecascientífica (2), among others; and we glimpse their potential to involve young people with science, empowering their task and themselves. So within the framework of a University Social Responsibility Project (SPU 2007), a joint work is started between teachers and students from the school and the Faculty, resulting in the birth in 2008 of the science exhibition DIVERTITE EXPERIMENTANDO (3). The purpose of the project was the planning, manufacture, management and organization of one science and technology interactive exhibition. The key aspect was that the students actually were the real drivers of the activities, generating a dynamic such the germ of the activity grow from them, in the conviction that transformation begins inside and radiates gradually the outside world. So school students under the guidance of teachers worked in the construction of devices (Figure 1), some of them, adaptations of known exhibits, but others according to students' own designs. They also became the guides and directors during presentations, carried out in the school, between 2008 and 2009; to which other neighborhood schools were invited as well as their families (Figure 2). These actions promoted the self-confidence and increases their self-esteem.

In 2010, the project ended, the financial contribution also, but the link with the technical school and DIVERTITE EXPERIMENTANDO remained. During 2010 and 2011, several presentations were carried out in different spaces provided, such as cultural centers and clubs (Figure 3).



Fig. 1: Students building the devices



Fig. 2: The first presentations of DE



Fig. 3: DE exhibition during 2010 (left) and 2011 (right).

Funny Science in the Neighborhood: DIVERTITE EXPERIMENTANDO becomes itinerant

The interactive exhibition as a “public space” is full of meaning, is a way to empower people as they experience their own curiosity and competence through engaging with science. Thus it was essential develop strategies to broaden the spectrum of public and to include those that are socially disadvantaged and have little relation to educational or cultural offers. It was thus necessary to conquer new scenarios, providing relevant information and making socially stimulating activities that encourage attendance, participation and ownership.

In 2012, through an agreement signed with the Tandil Town Hall, and within the framework of a National University Volunteer Project (Ministry of Education), the exhibition Divertite Experimentando becomes itinerant. “Funny Science in the Neighborhood” (4), that’s the name of the new project, covered in two years, 14 neighborhoods of the city. The Town Hall provided the places to make the presentations; the Volunteer Project the financial contribution and through it, a group of university students collaborated with the presentations. The exhibition was established for a week in each neighborhood; previously teachers and neighborhood representatives were contact to gather information about the target audience, which is very broad in terms of ages and interests. From schools, who took the sample as a trigger to formalize knowledge, to seniors who attended freely, as an instance of free-learning. The interactive space was designed to be assembled in the available space, provided in each neighborhood by the Town Hall, providing comfort and

accessibility (Figure 4), and taking into consideration the so-called visitors rights and barriers (5). The exhibits and the activities had to be adapt for the different places and for the different public, who were very diverse, adults, old people, disabled people, kindergarden children, etc.

During this two year proyect, more than 100 institutions were contacted and over than 3500 people visited the interactive science exhibition, mostly school groups as well as children (many alone, some accompanied by a(grand)parent), teenagers and adult groups.



Fig. 4: Funny Science in the Neighborhood

The Associations

During 2014, DIVERTITE EXPERIMENTANDO, is associated with two others projects. On the one hand, the Project “From Lab to Neighborhood” (FLTN), financed by the Department of American State (Alumni Engagement Innovation Fund), carried out by a researchers group of different centers of the country; and on the other, with a national Project proposed by the Ministry of Education. In the first case, an important financing is obtained that allows the growth in devices and equipment, and from the experience gathered by the members of DIVERTITE EXPERIMENTANDO, presentations of the FLTN science exhibition were carried out, between 2014 and 2015, in different cities of the province of Buenos Aires (6). Within the framework of the second one, a multidisciplinary team of UNICEN, with mathematicians, vets, chemists, biologist, system engineers, was formed and carried out the MIC (Interactive Science Exhibition), which made presentations, between 2014 and 2016, in the cities where UNICEN has its headquarters (Tandil, Azul, Necochea and Olavarría) (7).



Fig. 5: Exhibitions during International Year of Light (left) and MIC Tandil (right)

The main achievements obtained with these associations, besides the financial support, were to increase the team of researches involved and the possibility of visit other cities with the interactive exhibition. In this stage, a new action was incorporated: the development of workshops with teachers, prior to the presentations. The objective of these was to share with the teachers the principles of the interactive exhibition, giving them the opportunity to prepare their visits and use them as input for their classes. This had a very good impact on the subsequent development of the presentations, greatly improving the involvement of both teachers and students. On our side, the workshops made it possible to have a more direct contact with the teachers, who shared their doubts and needs.

For its part, DIVERTITE EXPERIMENTANDO continued making presentations in different places and opportunities, such as Science Week, Book Fair of Buenos Aires, International Year of Light, and currently, accompanying to Science Station, Popularization Science program of the Province of Buenos Aires, on its route through the province.

Divertite Experimentando today: new projects related to science education

The experience gained during the development of the workshops with teachers opened a new path of actions: activities directly with the primary and secondary teachers, independent of the exhibitions but linked to them by the principles of interactivity and scientific inquiry. In addition to the presentations, the DE team is dedicated today to the realization of workshops with teachers and the design of alternative experimental kits to the equipments of the school laboratories, accompanied by interactive and inquiry strategies of their use. It has also been associated in other projects that the members consider contribute to their formation and to the improvement of the proposal of DIVERTITE EXPERIMENTANDO. We are working with system engineers and researchers in science didactics to add new information technologies to our work, RA, RV, etc. (REFORTICCA Project), and we are collaborating in the incorporation of the principles of scientific museography in the local traditionalist museum (Figure 7).



Fig. 6: Workshops with primary and secondary teachers



Fig 7: DE in the local traditionalist museum

Other actions that the group carried out in this last time was to promote the engagement of the researchers with the communication of the science, which was materialized through a short career of specialization in Science Communication that is now being developed in the UNICEN.

About the impact of our actions

The success of Divertite Experimentando is measured basically by the number of people that assist to the temporary and traveling science exhibition, and by the number of requests for new or and repetition of the presentations, in our and in other cities. In all the presentations, short surveys of satisfaction are carried out in which it is inquired especially in those themes that have to be improved (devices, signs, instructions, guides, etc.). As is well known, it is difficult to measure the impact of interactive science centers, for many reasons, despite this there are strong evidences that indicate that these places strengthen science learning, enhance interest in science, strengthen motivation to learn science, increase confidence in science, among others. The most direct interlocutor we have are the teachers; they are asked for feedback via e-mail and social networks, and during the workshops. They tell us about the high degree of satisfaction that students acquire after going through the exhibition and how their enthusiasm increases with the consequent degree of involvement. Here arises for them the challenge of maintaining this reborn interest. For the teachers themselves, the passage through the exhibition opens them up to new tools to use in their classroom and they feel empowered in that.

In conclusion

All we have done in this ten years, in spite of not having a permanent place and financial support, have empowered us. We have gained experience and skills, we have met different people, each one with their curiosity, questions, doubts, and gifts for us. We have established important and interesting associations with different institutions and funds, such as educative institutions and organizations linked with science communications. Divertite Experiencing is part of the Argentine Association of Centers and Museums of Science and Technology (AACeMuCyT), the Popularization Network of Science and Technology for Latin America and the Caribbean (RedPOP) and the Solydeus Foundation.

This project was carried out by few people; and nowadays we are a 5 people group, who are physics and mathematician, and we are working in collaboration with a biologist, a chemist and computer specialists incorporating new technologies to our actions. We are not specialists in science communication but we believe in its importance and with our work we seek to contribute to the scientific literacy of the whole population so that all citizens are interested and inquire about the aspects of the world around us, encouraging informed decision-making about issues that affect the quality of life and the future of society.

References

1. María Calá, María Luján Castro, Rosana Ferrati, Ana Silva; Silvia Stupino. Demonstrate. 6th Science Centre World Congress, 6SCWC, Ciudad del Cabo, Sudáfrica, 2011.
2. www.exploratorium.edu; <https://cosmocaixa.es/es/cosmocaixa-barcelona>;
<http://www.ludotecascientifica.it/>

3. Maria Lujan Castro, Rodolfo Romero, Jose Gere, Mayra Garcymuño. Have fun experimenting with science. 6th Science Centre World Congress, 6SCWC, Ciudad del Cabo, Sudáfrica, 2011.
4. María Luján Castro, Ana Laura Echegaray, Marisol Martínez. Funny Science in the neighborhood. 13th International Public Communication of Science and Technology Conference. Proceedings of PCST 2014. ISBN 978-85-85239-89-3
5. Silvia Alderoqui, Constanza Pedersoli. La Educación en los Museos.. Paidós Ed. Buenos Aires, 2011.
6. Natalia Biani, Alan Garbarz, Pilar Alda, María Luján Castro, Juan Manuel Gomba. Muestra Itinerante e Interactiva de Ciencias “Del Laboratorio al Barrio”. XIV Reunión de la Red de Popularización de la Ciencia y la Técnica en América Latina y el Caribe. Corporación Parque Explora Ed. ISSN 2462-7755 (2015).
7. Ana Paula Madrid, María Luján Castro, Mayra Garcimuño, Mauro Natale, Marta García, Cecilia Ramírez. Conexiones itinerantes. XV Reunión de la Red de Popularización de la Ciencia y la Técnica en América Latina y el Caribe. Centro Cultural de la Ciencia MinCyT, Buenos Aires, Argentina. ISBN 978-950-34-1632-7, 633-638 (2018).

Acknowledgements

The authors thank the Commission of Scientific Investigations of the Province of Buenos Aires (CICPBA) that through the Reforticca Project partially supported the presentation of this work in PCST Congress held in New Zealand in April 2018.